

Analysis of problems in urban green space system planning in China

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Abstract: This paper discusses the major problems in urban green space system (UGSS) planning at both general and special planning levels in China. At general planning level, the problems of the UGSS are mainly from the ignorance in the characteristics of urban nature spaces and the limitation factors of the urban planning system. Great importance is attached to the green spaces in the built area of city, but the green spaces in surrounding areas of the city is unnoticed. Furthermore, because the area of UGSS planning is strictly limited by the administrative zoning, the green space system loses its integrity and rationality in spatial patterns. The schedules of urban development planning mismatched the paces and progresses of the ecological restoration cycles. At special plan level, the problem of the UGSS in China is that the green spaces quantity was over emphasized but the rationality of their layouts is neglected. Meanwhile, the requirement of the spatial structures and the green spaces layouts to balance between the urban development and the natural ecological environments is often ignored. With regard to the layouts in the UGSS planning practices, the existing problems are the compromising to the existing land-uses, the ‘filling in’ approach to plan green spaces and an over-emphasis on the layout patterns.

Keywords: Urban Green Space System (UGSS); planning; problems; quantity; layout

Introduction

In China, the urban green space system (UGSS) planning was initially developed in the 1950s. The green space ratio, green space coverage, public green area per capita were 15.0%, 16.9%, and 3.5 m², respectively, in 1986 (Jia 2001) and increased to 27.4%, 23.0%, and 6.52 m² by 2000, which is still in a relatively low level. Lack of a sound scientific and rational way in UGSS planning must be the main reason.

The UGSS planning document was first put forward in a legal form by the *National City Planning Act* (issued at 1989) as an indispensable part of the city planning. In November 1993, the China Ministry of Construction issued a statute: the *Regulation of the Indices in Urban Green Space Planning and Construction*. A series of relevant laws and regulations on green space planning were successively promulgated, which promoted the increases of urban green spaces significantly. With many researches on the UGSS planning, a relatively complete set of planning system has been initially formed. UGSS planning is no longer an appendant in urban master planning and attracts much attention from city governments increasingly. However, due to lack of sound planning theories and methods, a number of problems are still existed

in the UGSS planning practices. The urban planners often emphasize green space quantity but ignore the rationality of layout. This paper discusses the major problems in UGSS planning at both the master and special planning level.

Main issues in the UGSS planning

As a crucial component of the urban ecosystem, the urban green spaces have an important role in the ecological and environmental functions in cities. A better understanding of this role will contribute to the UGSS planning. Actually, some major spatial structure problems of green spaces in current urban planning mainly come from the ignorance of urban nature spaces and nature process (Hough 1984; Sporn 1985).

Ignorance of characteristics of urban natural system

Both urban and regional natural systems are very important to cities and their dwellers, whereas these systems have usually been ignored in city planning at some extent. Due to lacking of a comprehensive and systematic understanding on the characteristics and patterns of green spaces, the planners often fail to consider the most important ecological and environmental roles of UGSS in the planning.

The first problem is that the green spaces in the built area of city have been paid to more attention than those in the city region. At present, the planning spaces of a UGSS in China mainly comprise four types: various parks, protective green spaces, plants nurseries, and attached green spaces. Almost all green spaces are located in the built area and have to be planned in fulfillment with the national or local planning regulations. The national laws and regulations advocated that the regional green

Received: 2008-03-19; Accepted: 2008-09-23

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The online version is available at <http://www.springerlink.com>

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Responsible editor: Zhu Hong

spaces outside the built area must be taken into consideration in UGSS planning; however, some planners consider only the suburbs scenic areas, or even just optionally take a farm or woodland as an ecological balance land in the making of UGSS planning because of the lack of adequate planning theories and methods.

The second problem is that the boundary of a UGSS is strictly limited by the administrative zoning. Consequently, the green spaces system loses its integrity and rationality in spatial patterns, due to the fact that the manner of artificial division of land is not in consistence with the biological principles and also does not conform to natural landform reality (Wang 2007).

Furthermore, the ecological restoration usually lasts decades or even hundreds of years (Liu et al. 2002). However, the schedules of urban development planning and long-term planning (usually 20 years), in many occasions, mismatch the paces and progresses of the ecological restoration cycles. As a result, there have been some structural losses in the green space pattern and layout.

The limiting factors of special planning system

In urban master planning, the socio-economic system develops better than natural ecological environment system. This leads to the deficiency of master planning at the construction of the natural spatial structure; on the other hand, there is no a scientific and reasonable guidance to the lower-level special planning. Generally speaking, the principle of 'open space priority' at urban master planning stage would be a fundamental solution to these problems (Wang et al. 2007; Wang 2007). According to the urban ecology, the development of city form and scale should depend on the ecological and environmental carrying capacity of urban ecosystems, not merely the needs of socio-economic development.

Regarding the relationship between UGSS planning and urban master planning, the current UGSS planning relies too heavily on the urban master planning and is over-limited by its working frame. Meanwhile, the current UGSS planning overemphasizes the development of green spaces, while less consideration is given to the green space layout. As a result, the role of UGSS planning in improving the entire ecological and environmental functions is limited. If there is a lack of in-depth study on urban natural ecological environments and natural resources in the urban master planning stage, two steps should be implemented in the UGSS planning. Firstly, a thorough analysis of urban green spaces should be taken at both the urban and regional scale, and secondly, an adjustment to the improper distribution of urban green spaces in the master planning stage should be proposed.

Quantity and layout issues in the UGSS planning

In China, the early UGSS planning was mainly focused on the recreational function and traditional aesthetic rules of green spaces, but the ecological and environmental functions were not considered adequately. Since the 1980s, planners have begun to learn new planning methodologies from some developed coun-

tries in Europe and North America, but to date a complete framework of planning theories has not been set up yet (Wu 1998; Wang 2007). There is still a series of problems in China's UGSS planning due to lack of guidance of proper theories and methodology. Among these problems, the typical one is that the green spaces quantity was often emphasized but the rational layout is ignored.

Quantitative issues

The average green space area per capita and green space ratios are mainly two statistical indexes. As early as the 19th century, some sanitarian experts had put forth a rule, the average volume of carbon dioxide exhaled by city residents as a standard for determining the green space area per capita. Then, a 50-m² green space per person was proposed. In 20th century, experts in Germany, Japan and other countries proposed a standard of 40-m² urban green space in high quality or 140-m² suburb forest area per capita for reaching a balance between carbon dioxide and oxygen, to meet the ecological balance of human existence (Yang 2006; Sukopp 1995). Although the ecological and environmental organizations of United Nations put forward to a standard of 60-m² park area per person as the best living standard for urban environment in the late 1970s, all of the countries in the world adopt the standard in line with its own quantitative indices system. China has also developed an index system to guide the urban green space development; nevertheless, there have presently been a number of problems in the quantitative index system.

It is difficult to prove the proper theoretical basis for the green space quantity. Many researches show that the 60% air oxygen is from the land-grown plants and the rest from the marine plants or micro-organisms (Li 2004; Kendle et al. 1997). In fact, as long as the air flow in a small wind condition (more than 1.0 m/s), urban air would mix and exchange with more fresh air around and over the city because of the air movement, which generally makes a balance between the carbon dioxide and oxygen around city region. The quality of air in the built area is worse than that in the countryside, but the oxygen in the air is still balanced as a whole. Therefore, it is not proper that the urban green space standards are determined just by considering the carbon dioxide and oxygen balance.

Compared to the general standard of green space of 20-m² park area per capita in developed countries, the park area index of most cities in China is fairly low. Because of this gap, more consideration has to be given to the administrative quantitative indices in the index system of UGSS planning in China. Therefore, the UGSS planning is largely tied up by the green space indices from the national statutes. In the planning practices, planners often intend to meet the rigid indices such as the park area per capita, the green space ratio and so on. Green space standards have become a fetish of a baton for UGSS planning, and the so-called advanced planning indices is recognized as the most important yardstick of the advanced UGSS in some cities. However, the requirement of the spatial structure to balance the urban development in the natural ecological environments is

often left far behind.

Sometimes, the application of the mandatory planning indices leads to a converse way from its initial expectation in the planning practices. Because the urban border is administratively divided, a delimitation of the built or planned city boundary in different ways results in great differences in green space ratios (Fig. 1a). Green space indices are set to be only related to the range of planned land development. However, in some occasions, the total quality of regional open spaces is more important (Fig. 1b). On the other hand, the green spaces at different locations would take disparate roles in the UGSS, whereas they are similar in shape and size (Fig. 1c).

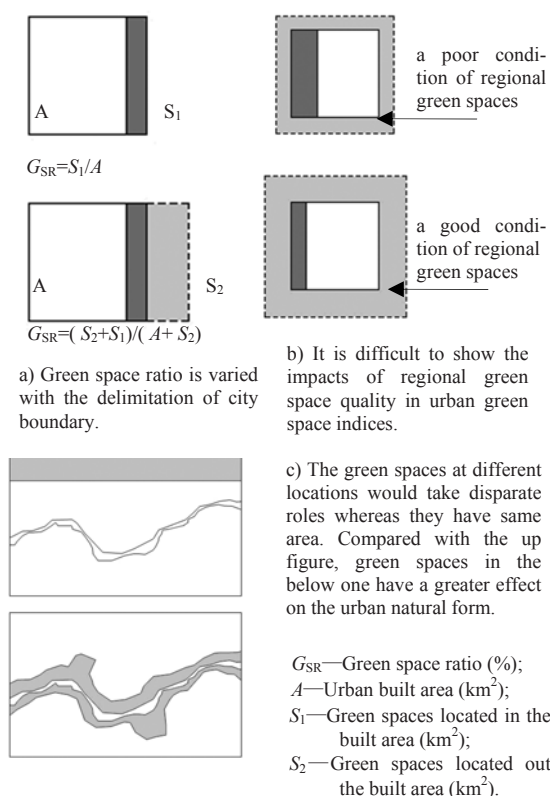


Fig. 1 Some quantitative problems in UGSS planning

Green space indices give a fairly simple way for measuring the total green space quantity, but cannot meet the demand of evaluating the layout of the green spaces. As a solution, we suggest that a subdivision zoning with quantitative indices could guarantee both the quality and the quantity of the green spaces.

Layout issues

The aim of UGSS layout is to locate all types of green spaces properly in accordance with the urban spatial structure. Regulations on green space planning are attached great importance to the green space layout in UGSS planning; for example, the Ministry of Construction in 2002 promulgated *An Outline for UGSS Planning Compilation (draft)*, emphasizing the planning structure, layout and zoning. With regard to the layout problems, some scholars have put four basic goals of UGSS layout and a

series of layout principles (Jia 2001; Yang 2006). These principles can be summarized as general principle, recreational principle, environmental principle and landscape principle. It is difficult for planners to apply these basic layout principles to UGSS planning practices unless more detailed methods are offered. However, only the green space layouts for recreational usage and sanitation protection can be provided in some more detailed measures. For example, for the recreation purpose, the services radius has been of consideration in the park green space layout in urban center districts. The first requirement of park green space layout is to meet the outdoor recreational needs of all residents, so the park catchments ranges should be kept to cover the whole residential areas in the layout of all urban comprehensive and community parks. In the hygiene protection green space layout, according to the urban ecological environment characteristics and land-use plan, different types of protective green spaces should be set up to meet the requirements for industrial hygiene, ecological protection, transportation strip separation and urban clusters protection. On the whole, it is also not easy for planners to grasp comprehensively in the UGSS planning without an appropriate methodological and technological support.

Furthermore, nowadays little attention has been paid to the theory and method studies of green spaces layouts. Researchers are mainly interested in the classification of green spaces forms and types. For example, some experts classify the urban green space system into four kinds of layouts: patch, belt, wedge, and the mixed. The basic layout forms are summed up as the ‘point, line, and district’ patterns in some books or textbooks on urban planning and UGSS planning (Tongji University 1982; Jia 2001; Yang 2006). Nevertheless, a irregular UGSS pattern composed with the ‘point, line, and district’ green spaces is properly suited to almost all cities. This form-based method is often used in the UGSS planning practices, in a blindly pursuit of the drawing effect, or the meaningless combination of ‘point, line, and district’, but the layout of urban green spaces has not been really considered from a view of the urban landscape structure. We should firstly consider the functions of green spaces layout as a system, rather than the forms of green spaces layout.

The third problem is on the compromising to the existing land-uses, which expressed a despised view toward the integration of green space structure. On the one hand, in UGSS planning, planners usually use the existing and readily available land only. On the other hand, some policy strategies and planning principles, for example the ‘filling in’ approach to allocate green spaces in the past planning, are appropriate only under some conditions. This ‘filling in’ approach have caused a large number of small sporadically spread green spaces. These small pieces of green spaces are suitable for recreational use, but make a rather limited effect in carrying the overall ecological and environmental functions in a bigger city, because this kind of urban green spaces development could not possibly match up to the city with respect to a large form structure. This is the compromise to the status of urban land-uses, and the urban natural structure is not taken as a whole.

Finally, there have been two completely opposite viewpoints on the urban green space layout. One is that the urban green

spaces should be relative concentration and continuous in order to shape some forms for the remaining cities room. Meanwhile, large green spaces can offer urban dwellers a natural environment to really escape from the crowded city. Another view is that urban green space should be smaller and distributed evenly over the entire neighborhoods for using conveniently. These two disparate views come from the difference in the understanding of the main functional concepts on urban green spaces. The former takes urban green space as a special quality in the city, but the latter takes urban green space as a part of the basic needs in daily life. With regarding to the problem of continual green spaces, Kevin Lynch, a famous planning theoretician, thought that the consecutive layout cannot effectively shape a new urban form, unless the urban green space itself is a very magnificent natural landscape such as the ocean, the river or the mountain. So there is no need to link urban green spaces directly (Lynch 1960). Despite the far-reaching impact of his view, to maintain large centralized green spaces and to establish ecological networks in urban green space system have become a consensus as the development of urban ecology and landscape ecology in 1980s (Sukopp et al. 1995; Hudson 1991; Cook 2000). Therefore, the former viewpoint is important to the green spaces patterns and layouts at a city scale, especially for a bigger city.

Conclusion

Since the *National Urban Planning Act* was issued in 1989, most cities in China have compiled or amended the UGSS planning documents, which do guide to the urban green spaces development and construction. However, a number of issues have come forth in the past planning practices. General problems of green spaces in current urban planning are the ignorance in urban nature spaces. In the UGSS planning, problems are mainly reflected in the quantity and layout aspects. The universal issue is that the green space quantity is emphasized but its layout is often ignored. Due to an over-emphasis on the quantitative indices of the average park area and the green space ratio (the compulsive standards requested by the relevant national laws and regulations), most of the UGSS planning practices were misguided.

In conclusion, these problems discussed above are crucial for establishing a better structure of urban green spaces. We hope that the rationality of urban green spaces layout in the UGSS planning would be consistent with the goals of the compact and conservation-oriented city form in China.

Acknowledgments

The author is grateful to Professor Wang Jianguo in College of Architecture of Southeast University for the PhD dissertation direction and Mr. Chen Jiahe for his helpful suggestions for improving this manuscript.

References

- Cook EA. 2002. Landscape structure indices for assessing urban ecological networks. *Landscape and Urban Planning*, **58** (2): 269–280.
- Hough M. 1984. *City Form and Natural Process*. New York: VNR Co, 5–10.
- Hudson WE. 1991. *Landscape Linkages and Biodiversity*. Washington D.C: Island Press, 27–39.
- Jia Jianzhong. 2001. *Urban Green Space Planning and Design*. Beijing: China Forestry Press, 15–24. (In Chinese)
- Kendle T, Forbes S. 1997. *Urban Nature Conservation*. London: E & FN Spon, 2–15.
- Li Jingwen. 2004. *Forest Ecology*. 2ed edition. Beijing: China Forestry Press, 141–153. (In Chinese)
- Liu J, Taylor, W. 2002. *Integrating Landscape Ecology into Natural Resource Management*. Cambridge: Cambridge University Press, 21–22.
- Lynch K. 1990. The openness of open space. In: Banerjee T, et al (eds), *City Sense and City Design: Writings and Projects of Kevin Lynch*. Cambridge, Massachusetts: The MIT Press, 396–412.
- Spirn AW. 1984. *The Granite Garden: Urban Nature and Human Design*. New York: Basic Books Publishers, 3–5.
- Sukopp H, Numata M and Huber A. 1995. *Urban Ecology as the Basis of Urban Planning*. The Hague: SPB Academic Pub., 1–218.
- Tongji University (ed). 2006. *Urban Park and Green Space Planning*. 2nd edition. Beijing: China Building and Industry Press, 68–71. (In Chinese)
- Wang Jianguo. 2004. *Urban Design*. Nanjing: Southeast University Press, 120–123. (In Chinese)
- Wang Xiao-Jun, Wang Jian-Guo. 2007. On the priority of urban open spaces. *Chinese Journal of Landscape Architecture*, **23** (3): 53–56.
- Wang Xiao-Jun. 2001. Urban peripheral green space. *Journal of Forestry Research*, **12** (1): 67–70.
- Wang Xiao-Jun. 2007. Pattern and layout of urban open space based on ecological and environmental mechanisms. PhD dissertation, Nanjing: Southeast University, 5–8. (In Chinese)
- Wu Renwei. 1998. Development in foreign urban open space. *Urban Planning Review*, **22** (6): 39–43. (In Chinese)
- Yang Laili. 2006. *Urban Park and Green Space Planning*. Beijing: China Forestry Publishing House, 175–177. (In Chinese)